GEO S Series

S805 5° Tangent Array Module

S830 30° Tangent Array Module

CD12 HyperCardoid Subbass

User Manual

GEO is new technology

The 3 year GEO R&D Project has generated the following patent applications:

- The GEO Hyperboloid Reflective Wavesource™ works on a different principle from the coercive megaphone-variant horns you know and love/hate. If you apply "tried and true" methods to this entirely different species of waveguide, the results are likely to be very different from what you expect.
- The Configurable Directivity Device. A waveguide that allows the operator to alter its behaviour in the field? Yes. Another unprecedented development that's easy to use – once you know how and when.
- The Directivity Phase Device needs no operator input to work properly, but it's always nice to know…

GEO is not hard to use when you understand how…

The R&D behind GEO is revolutionary, but it is grounded in years of practical experience with the problems of delivering high quality sound to large audiences at professional SPL levels. GEO includes a simple yet powerful and highly predictive design tool – GEOSoft2. The array assembly system is keyed to the design software and will easily enable you to deploy your design with precision to 0.01°. The NX242 includes presets that have been tested and measured by NEXO R&D. They cover virtually any GEO tangent array configuration, horizontal or vertical, with or without the CD12 HyperCardioid Subbass.

GEO is a high precision system

The GEO Wavesource controls acoustic energy more precisely than previous generations of coercive waveguides based on the megaphone. This precision makes the GEO system more capable than previous array elements. It also makes GEO less forgiving of mistakes in design and deployment. While megaphone-variant horns never combine into a coherent array, they can deliver acceptable results even if the design and deployment of the system is less than optimal. This is not the case with GEO.

GEO is a tangent array, not a "line array"

GEO Technology is equally effective in designing and deploying tangent horizontal arrays or curved vertical arrays. For best results in a specific application you need to know how multi-speaker arrays interact with audience geometry, along with the benefits and drawbacks of curved vertical arrays and horizontal arrays.

Curved vertical tangent arrays require different design techniques

For the past 20 years, sound reinforcement professionals have worked with horizontal arrays that use megaphone-variant horns to deliver "[more or less] equal power to equal angles." Curved vertical arrays are designed to deliver "equal power to equal areas." When conventional coercive horns are used in the array elements, their lack of precision masks errors in the design of the array and in the aiming of the individual cabinets. The highly precise GEO wavesource responds accurately, consistently and predictably to the design and deployment of a curved vertical tangent array. This is why the GEO rigging system is designed to control angular splay to 0.01° accuracy.

GEO curved vertical tangent arrays require different operational techniques

Over the years, system designers and operators have developed a number of signal processing techniques to disguise and partly overcome the limitations of coercive megaphone waveguides. "Frequency shading," "amplitude shading," "system tuning," all of these are tools of the advanced sound system operator. NONE OF THESE TECHNIQUES ARE APPLICABLE TO GEO TANGENT ARRAYS. Instead of enhancing the array's performance they will severely degrade it.

Take a little time to learn how to get great results with GEO Technology. It's an investment that will pay off in more satisfied clients, more efficient operating procedures and more recognition for your skill as a sound system designer and operator

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INTRODUCTION

Thank you for selecting NEXO GEO S Series products. This manual is intended to provide you with necessary and useful information about your GEO System, which includes the following products:

- S805 5° Tangent Array Module. 8" (20cm) Neodymium Hi-flux 16 Ohm LF Driver and 1" Throat Neodymium HF Driver on a 5° Hyperboloid Reflective Wavesource. Your main building block for curved vertical tangent arrays; integral precision array assembly system.
- S830 30° Tangent Array Module. 8" (20cm) Neodymium Hi-flux 16 Ohm LF Driver and 1" Throat Neodymium HF Driver on a 30° Hyperboloid Reflective Wavesource. The building block for horizontal tangent arrays, and the tangent down-fill element for curved vertical arrays; integral precision array assembly system.
- CD12 HyperCardoid Subbass. Two 12" (30cm) Long Excursion Neodymium 6 Ohm Drivers, each controlled by one DSP channel, creating a 120° x 120° hypercardioid pattern. Can be flown or ground-stacked.
- NX242 Digital TDcontroller. Provides comprehensive control of the above GEO S Series loudspeakers in multiple configurations. For a complete description of this unit, please refer to the NX242 User Manual. Please remember that the NX242 Digital TDcontroller's DSP algorithms and parameters are software and are updated regularly. Please consult the NEXO web site (www.nexo.fr or www.nexo-sa.com) for the latest software releases.
- GEO Flying System. Coupled with the integral array assembly system on GEO S Series cabinets, provides safe, flexible and simple means of flying GEO Tangent Arrays. NOTE: GEO Tangent Arrays control the dispersion of acoustic energy with a high degree of precision. Inclinometers and laser aiming devices are essential to ensure proper audience coverage when hanging or flying a GEO Tangent Array.
- GEOSoft2 Array Design Software. MATLAB based Windows software simplifies the design and implementation of vertical tangent GEO arrays.

Please devote some attention to reading this manual. A comprehensive understanding of GEO waveguide theory, tangent arrays, and specific features of the GEO S Series will help you to operate your system at its full potential.

GENERAL SET-UP INSTRUCTIONS

Speaker Wiring

The loudspeakers are connected to power amplifiers via NL4FC SPEAKON connectors (not supplied). A wiring diagram is printed on the connection panel located on the back of each cabinet. The in/out pins of the SPEAKON sockets are identified. The sockets are connected in parallel within the enclosures (see the Connections Diagrams section of this manual). Either connector can be used to connect power amplifiers or to power an additional GEO Tangent Array Module (NEXO recommend a maximum of six S Series Tangent Array Modules per amplifier channel).

NB: The front loudspeaker of the CD12 is wired 2+ & 2- while the rear loudspeaker is wired 1- & 1+. ***NEVER connect the CD12 to the GEO S805/S830****.*

Cable choice consists mainly of selecting cables of the correct sectional dimension (size) in relation to the load resistance and the cable length. Too small a cable section will increase both its serial resistance and its capacitance; this reduces the electrical power delivered to the loudspeaker and can also induce response (damping factor) variations.

For a serial resistance less or equal to 4% of the load impedance (damping factor = 25), the maximum cable length is given by:

$L_{max} = Z \times S$ S in mm^2, Z in Ohms, L_{max} in meters

The table below indicates these values, for 3 common sizes.

Load Impedance (Ω)	2	3	4	6	8	12	16
Cable section	**Maximum Length (meters)**						
1,5 mm² (AWG #14)	3	4.5	6	9	12	18	24
2,5 mm² (AWG #12)	5	7.5	10	15	20	30	40
4 mm² (AWG #10)	8	12	16	24	32	48	64

Examples :

The GEO S805 and S830 have a nominal impedance of 16 ohms, so a 6x GEO S8 cluster wired in parallel will present a 16/6 = 2.7 Ohms load impedance. The maximum acceptable 2x2.5 mm^2 (AWG #12) cable length L_{max} for such a cluster is 6.75 meters.

The CD12 subwoofer has a nominal impedance of 2 x 6 Ohms, therefore 2 CD12s wired in parallel will present a 2 x 3 Ohms load impedance. The maximum acceptable 4x4 mm^2 (AWG #10) cable length L_{max} is then 12 meters.

IMPORTANT NOTE*: Long speaker cables induce capacitive effects – up to hundreds of pF depending on the quality of the cable, with a high-pass effect in high frequencies. If long speaker cables must be used, ensure that they do not remain coiled while in use.*

Amplifier Selection

Power

GEO S8 Series array elements are rated for 500 Watts power handling. Although each array element has a 16 Ohm nominal impedance, NEXO recommends that you connect no more than six S8 Series array elements to a single amplifier channel. The amplifiers used for this application should be capable of delivering 1500 to 3000 Watts into a low impedance (typically specified as 2 Ohm) load. Budget constraints are the only reason to select lower output power amplifiers. A lower power amplifier will not reduce the chances of driver damage due to overexcursion, and may actually increase the risk of thermal damage due to sustained clipping.

The CD12 requires two amplifier channels delivering separately processed signals to produce its hypercardioid pattern. The amplifier model should be the same as that used for the GEO S8 Series array elements. Two CD12s can be connected in parallel: take care that both front woofers and both rear woofers are connected in parallel.

Current rating

It is very important that the amplifier behaves correctly under low load conditions. A speaker system is reactive by nature: on transient signals like music it will require four to ten times more instantaneous current than its nominal impedance would indicate. Amplifiers are generally specified by continuous RMS power into resistive loads, however the only useful information about current capacity is the specification into a 2 Ohm load. It is possible to perform an amplifier listening test by loading the amps with twice the number of cabinets considered for the application (2 speakers per channel instead of one, 4 instead of 2) and running the amps up to the onset of clipping. If the signal does not noticeably deteriorate, the amplifier is well adapted (overheating after approximately ten minutes is normal but thermal protection must not operate too quickly after starting this test).

Amplifier gain settings

Technical knowledge of the amplifiers to be used with the system is essential. This data is the key to the correct alignment of the system. It is especially important to know the gain of all amplifiers used in your set-up. The tolerance should be about ±0.5 dB. In practice this can be difficult to achieve because:

- Some amplifier brands have an identical input sensitivity for models of different power rating (this infers a different voltage gain for each model). For example, a range of amplifiers with different power outputs, all having a published input sensitivity of 775mV/0dBm or 1.55V/+6dBm, will have a wide range of actual gains – the higher the power, the greater the gain.
- Various other brands may offer constant gain but only within a given product range, for example they may fit fixed input sensitivity only on their semi-professional amps.
- Even if a manufacturer applies the constant gain rule to all models, the value selected will not necessarily be the same as that chosen by other manufacturers.
- Some products can exhibit manufacturing tolerances for the same model of ±1dB or more. Some amplifiers may have been modified, possibly without any label indicating the new values. Others may have gain switches fitted internally where it is impossible for the user to verify the actual setting without opening the amplifier casing. In cases where you don't know the gain of your amplifier (or want to check it) please follow this procedure:
    1) Unplug any loudspeakers from the amplifier outputs
    2) With a signal generator, feed a sine wave at 1000Hz at a known voltage (say 0.5V) to the input of the amplifier under test
    3) Measure the voltage at the output of the amplifier
    4) Calculate the gain using the formula Gain = 20 * LOG10(Vout/Vin).

Some examples:

Gain Vin	20dB	26dB	32dB	37dB (1.4V sensitivity / 1350Wrms)
0.1V	1V	2V	4V	7.1V
0.5V	5V	10V	20V	35.4V
1V	10V	20V	40V	70.8V

Remember that constant sensitivity settings will give a different gain value when the amplifier power is different.

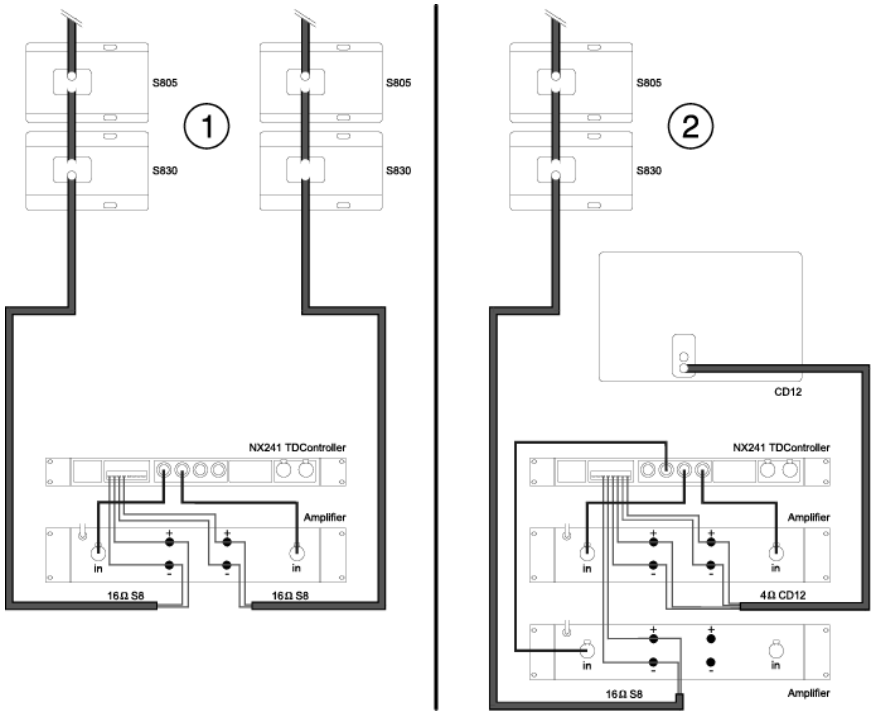
Gain value

NEXO recommends low gain amplifiers: +26dB is recommended, as it is at the same time adequately low and quite common amongst amplifier manufacturers. This gain setting improves signal to noise ratio and allows all preceding electronic equipment, including the NX242 TDcontroller, to operate at optimum level. Remember that using a high gain amplifier will raise the noise floor proportionally.

Advanced protection

Some high-end amplifiers may include signal processing functions similar to those found in the NX242 TDcontroller ("loudspeaker offset integration", "limiter", "compressor," etc.). These functions are not adapted to specific system requirements and may interfere with the complex protection algorithms used in the NX242. NEXO do not advise using other protection systems in conjunction with the NX242 and they should be disabled.

Connection Diagrams



The NX242 TDcontroller provides two basic modes of operation with GEO S Series products, as shown below.

1) Stereo GEO S8 with no CD12 sub,
2) Mono GEO S8 with CD12 Sub.

NX242 DIGITAL TDCONTROLLER SETTINGS

The GEO S Series cabinets will not perform correctly without the NX242 TDcontroller. Sound quality and reliability are totally dependent on the correct use of the NX242 TDcontroller, in accordance with the instructions provided in this manual and in the NX242 User Manual.

All manuals & associated technical notes must be read before set-up. Please contact your NEXO agent for any literature you may need. The NX242 Digital TDcontroller is able to drive the entire current NEXO range (GEO, PS & Alpha series, CD12 subs). The following GEO set-ups are examples, for a complete and updated list please refer to the documentation describing the NX-LOAD.

GEO Vertical Arrays

Input/Output Assignments: GEO S8 Series Wideband Configurations (No Sub)			
Input A	Input B		
Left	Right		

Output 4 HF	Output 3 HF	Output 2 LF	Output 1 Sub
Left	Right	No Signal	No Signal

S805 4-8 boxes No Sub

Stereo Setup. Input A (Left) & B (right). Output 3 (left) and 4 (right). No signal on output 1 &2.

Configure GEO S805 Wideband for 4-8 boxes.

S805 9-16 boxes No Sub

Stereo Setup. Input A (Left) & B (right). Output 3 (left) and 4 (right). No signal on output 1 &2.

Configure GEO S805 Wideband for 9-12 boxes.

Input/Output Assignments: GEO S8 + CD12 Configurations			
Input A	Input B		
Mono	No Signal		

Output 4 HF	Output 3 HF	Output 2 LF	Output 1 Sub
No Signal	GEO S8	CD12 Front Driver	CD12 Back Driver

S805 4-8 boxes CD12 Ground

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Output 3 (GEO), no signal on Output 4.

Configure GEO S805 (4-8 boxes) with CD12.

S805 9-6 boxes CD12 Ground

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Output 3 (GEO), no signal on Output 4.

Configure GEO S805 (9-16 boxes) with CD12.

S805 4-8 boxes CD12 Flown

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Output 3 (GEO), no signal on Output 4.

Configure GEO S805 (4-8 boxes) with CD12 flown.

S805 9-16 boxes CD12 Flown

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Output 3 (GEO), no signal on Output 4.

Configure GEO S805 (9-16 boxes) with CD12 flown.

GEO Horizontal Tangent Arrays

Input/Output Assignments: GEO S8 Series Wideband Configurations (No Sub)			
Input A	Input B		
Left	Right		

Output 4 HF	Output 3 HF	Output 2 LF	Output 1 Sub
Left	Right	No Signal	No Signal

S830 3 boxes No Sub

Stereo Setup. Input A (Left) & B (right). Output 3 (left) and 4 (right). No signal on output 1 &2.

Configure three GEO S830 Wideband.

Input/Output Assignments: GEO S8 + CD12 Configurations			
Input A	Input B		
Mono	No Signal		

Output 4 HF	Output 3 HF	Output 2 LF	Output 1 Sub
No Signal	GEO S8	CD12 Front Driver	CD12 Back Driver

S830 3 boxes CD12 Flown

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Output 3 (GEO), no signal on Output 4.

Configure three GEO S830 with a CD12 flown.

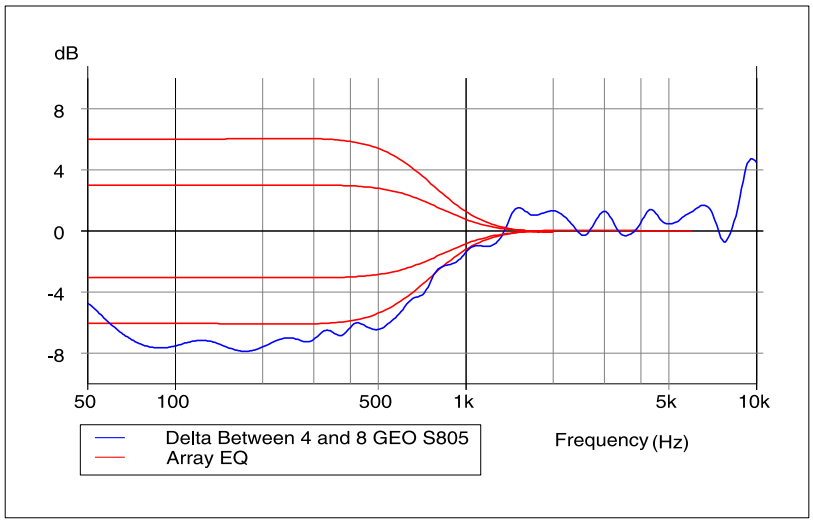
S830 3 boxes CD12 Ground

Mono Setup. Input A. Output 1 (back driver of the CD12), Output 2 (front driver of the CD12), Output 3 (GEO), no signal on Output 4.

Configure three GEO S830 with a CD12 ground.

Speaker Quantity

Speaker Quantity (MENU 1.7) parameter acts on an Array EQ that has been tuned to reduce the coupling effect of multiple GEO cabinets at Low Frequencies. It will help you to fine tune your system according to the number of cabinets and personal taste. Array EQ is at 0dB when Spekaer Quantity is 8, boosts for lower quantities, and cuts for higher quantities.



Delays & System Alignment

The NX242 internal time adjustments (factory presets) have been optimised to provide the best crossover possible between the MAIN and SUB systems. **The reference point for this adjustment is the front side of each cabinet.** (That means that the internal delays are set for a S8 cabinet standing close to the CD12, with both front sides being aligned).

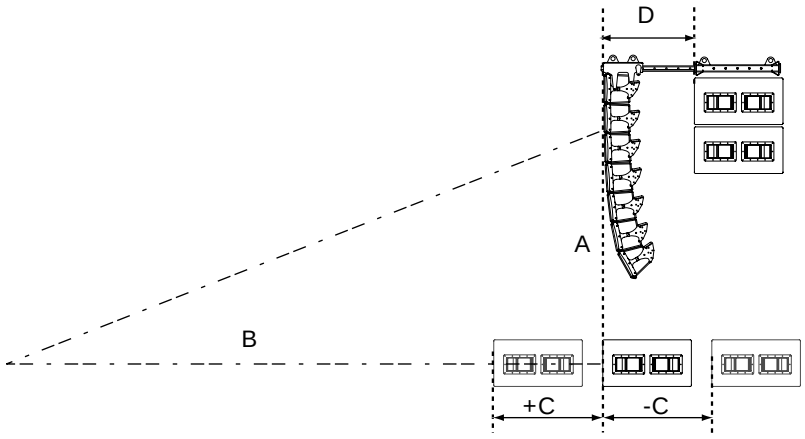
Should you rig your CD12 behind the S8, you will have to delay the MAIN system the according distance D. The delay parameter is set in MENU 1.2 (set the units to meters or feet according to your preference).

Should you leave your CD12 on the ground, you will have to adjust the delay on the CD12 (using MENU 1.2) according to the path difference between the flown GEO and the ground stacked CD12. We recommend you to adjust your system for the more distant listening point.

In the following case where A is the average height, B the listening point and C the difference between front sides of both systems

CD12 Delay = $\sqrt{A^2 + B^2} - B \pm C$ (specify meters or feet)

If this formula gives a negative result the delay should be implemented on the MAIN channel.



Initial Set-up Precautions

When running up a system that includes new cabinets for the first time, the power should be increased slowly to approximately 50% and the system operated at this level for two hours. During the following two hours of operation the power level should be limited to approximately 75%. This procedure allows the adhesives and suspensions within the loudspeaker components to stabilise and will extend their working life.

In all cases, it is advisable to connect the loudspeakers only after all the other components have been wired and are operating correctly. This is particularly important for the amplifiers and the TDcontroller. It is a good practice to turn down all the amplifier gains before connecting the cabinets and then turn them up again individually with a medium level music source fed into the system. The sense LEDs of the corresponding TDcontroller channel should light up accordingly. This will help to locate cabling errors, particularly channel line inversions, which would disable the TDcontroller protections and may invalidate the warranty.

IMPORTANT
If more than one amplifier is being driven from an output of the NX242 TDcontroller, only those amplifiers that are not connected to sense inputs may be attenuated. If the sensed amplifier is attenuated and the slave amplifiers are not, severe system damage will result!

DEPLOYING GEO TANGENT ARRAYS

Vertical vs. Horizontal

One of the advantages of the GEO S Series is the ability to construct coherent vertical and horizontal arrays from the appropriate GEO Tangent Array Modules. These two types of arrays are very different in their behaviour and intended applications.

Vertical tangent arrays of GEO are intended for applications where the horizontal coverage (80 or 120º) is suitable for the application and even SPL from the first row to the last row of the audience is desired. The GEOSoft2 software will help you design a vertical array of S805 and S830 cabinets and tailor the acoustic wave generated by the cluster to fit your audience profile, providing equal power to equal areas. When done properly, the GEO S Series can provide extremely even SPL throughout the depth of your audience, including balcony coverage.

Horizontal tangent arrays of GEO S830 cabinets provide exceptional control of horizontal coverage but are not intended to provide the same even SPL capability as a vertical array. Horizontal arrays deliver equal power to equal angles, with SPL decreasing as you move further back in the audience. However, the GEO S830 is designed to array tangentially with adjacent S830 cabinets providing a much more coherent wave front from an array of multiple cabinets than conventional arrayable cabinets. This allows the user to provide 30º increments of horizontal coverage as needed.

CD12 HyperCardioid Subbass

The CD12 is a hypercardioid subbass device providing directional low frequency energy with a dramatic reduction in low frequencies behind the loudspeaker(s). This is achieved using the interaction of two independently driven 12” drivers, highly specialized ports, and the digital processing capabilities of the NX242 Loudspeaker Controller.

It is important to follow these guidelines to attain the best performance from the CD12;

- Keep at least 3’ to 4’ (1m) of space around the CD12(s) when they are located on the ground. Objects or barriers within this space can interfere with the interaction of wave fronts from the front and rear of the CD12.
- Drive the front and rear drivers with identical amplifier channels set to the same gain. The operation of the CD12 is based on the assumption that both the front and rear sub-systems are identical in terms of the amplifier’s electrical performance.
- When flying the CD12(s), use the linking bar to connect the CD12 bumper to the GEO Bumper and keep at least 50cm (~20”) of space between the back of the GEO cabinets and the front of the CD12(s).. It provides enough distance that the GEO cabinets will not interfere with the acoustical wave front from the CD12. For time alignment with the main system see page 10 “Delays & System Alignment”
- When ground stacking the CD12, it is better to stack them vertically than horizontally.
- When hanging or stacking multiple CD12 cabinets make sure they are all oriented correctly; fronts forward and tops up. Do not hang one CD12 upside down relative to the others.

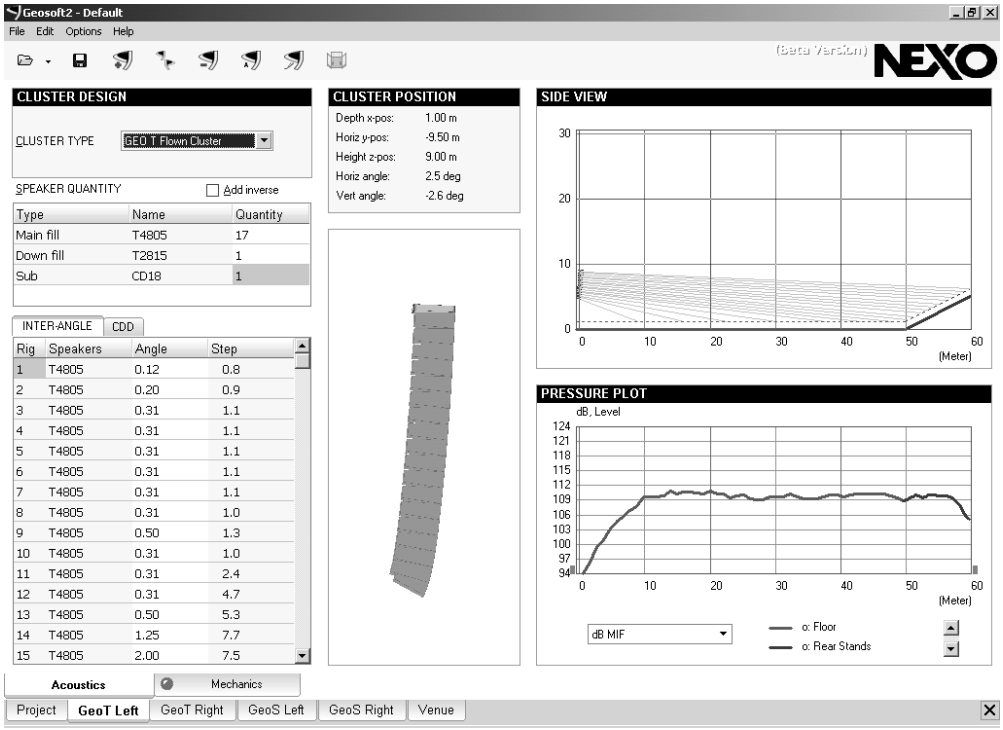
GEOSOFT2

GEOSoft2 software processes measured speaker data with complex mathematical algorithms to assist the user in designing vertical tangent GEO arrays that provide even SPL throughout the depth of the audience. Due to the complexity of the interaction of multiple cabinets, it is simply not possible to reliably design curved vertical arrays without using the processing power of a computer to predict the optimum array structure for a given audience geometry. The design logic is far more complex than looking at a section drawing of the venue, measuring the overall angle needed to cover the audience from your cluster location, and dividing by 5º to determine the number of S805 cabinets you will need.

GEOSoft2 is an easy to use tool that will allow you to shape the energy leaving the cluster to fit your audience. In addition you will be able to predict the average and peak SPL of the system to ensure you have provided enough cabinets for the application.

GEOSoft2 is used only for determining the structure of the cluster to attain proper coverage in the vertical plane. In the horizontal plane, you project 80º, 100º, or 120º degrees of horizontal coverage from your cluster locations on a plan view of the venue to determine optimum locations for your hanging points.

For a more complete and up-to-date information, Geosoft2 can be downloaded from Nexo's website www.nexo-sa.com. Please check that link for application examples and latest upgrades periodically.

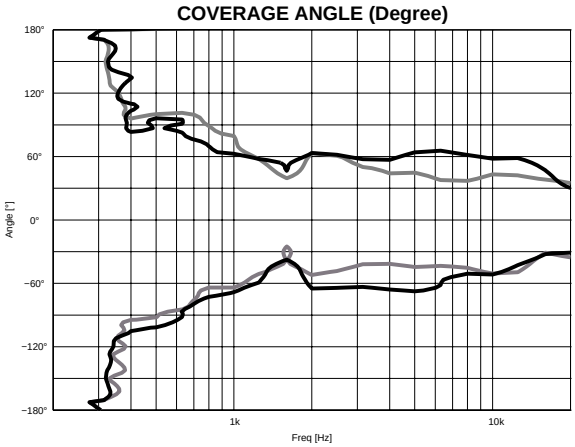


USING THE CONFIGURABLE DIRECTIVITY DEVICE

The GEO Wavesource controls dispersion of acoustic energy using an hyperboloid acoustical reflector in the "coupling plane" (the vertical plane of a curved vertical tangent array) and a diffraction slot in the "non-coupling plane" (the horizontal plane of a curved vertical tangent array). The patent-pending Configurable Directivity Device consists of bolt-on flanges that alter the diffraction slot's exit flare rate. The flanges look like this:

In the graph below, the red curve shows the dispersion in the non-coupling plane with the flanges installed: the narrower blue curve shows the dispersion without the flanges.

GEO Hyperboloid Reflective Wavesource with Configurable Directivity Device flanges

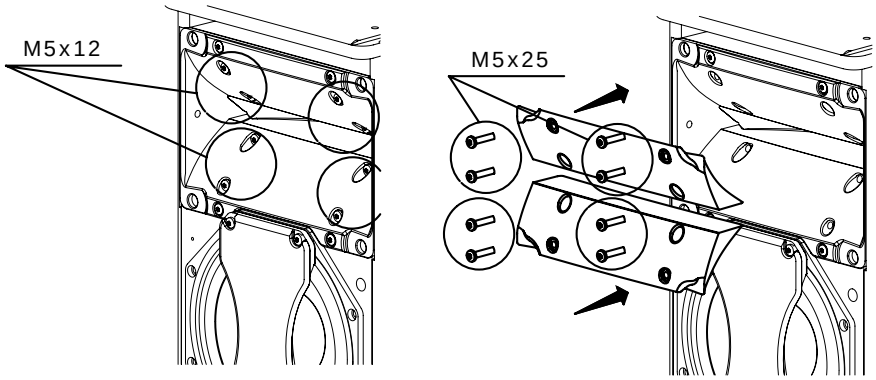


Non-coupling plane dispersion vs. frequency, with (120° black) and without (80° grey) Configurable Directivity flanges installed

Installing & removing GEO's Configurable Directivity flanges

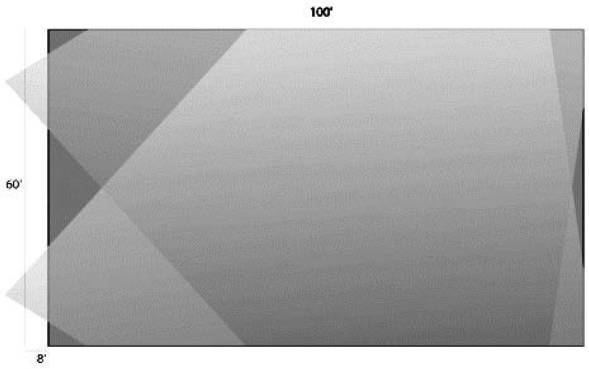
GEO S805 are shipped in the 80° dispersion (without the flanges installed). GEO S830 Series loudspeakers are shipped with the flanges installed (120° dispersion in the non-coupling plane). To remove the flanges for narrower 80° dispersion in the non-coupling plane, remove the front grill and the four TORX (head 25) screws in each side of the GEO Wavesource. Store these screws with the flanges. To fill in the holes, use the shorter replacement screws provided with your GEO S8 Series loudspeaker. *Do not attempt to screw the longer flange attachment screws into the waveguide attachment points: this will damage your GEO S8 Series loudspeaker's Hyperboloid Reflective Wavesource.*

***NOTE**: A torque of **1N.m** maximum shall be applied to the screw. NEVER USE POWER TOOLS TO INSTALL OR REMOVE CDD FLANGES: THEIR EXCESSIVE TORQUE CAPABILITY CAN EASILY DAMAGE THE GEO WAVESOURCE.*

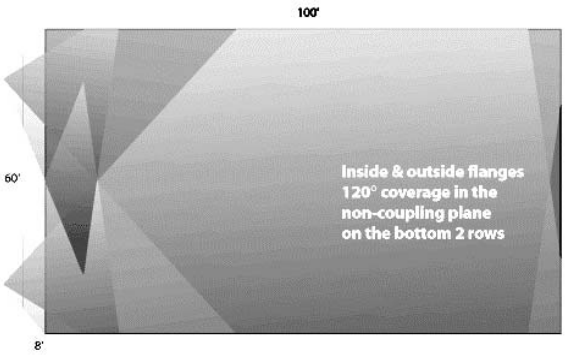


When & where to use Configurable Directivity flanges

The diagram below can be considered as a plan view of the audience area shown in Figure 1. Instead of looking through the sidewall, we are looking through the ceiling. While the GEO cluster will deliver even SPL from the front to the rear of this audience area, there are “holes” near the front in the centre and at the outside edges. We cannot fill the outside coverage gaps without enlarging the centre gap, and vice versa.



- Figure 1 :Plan view of coverage using two GEO curved vertical arrays without Configurable Directivity flanges



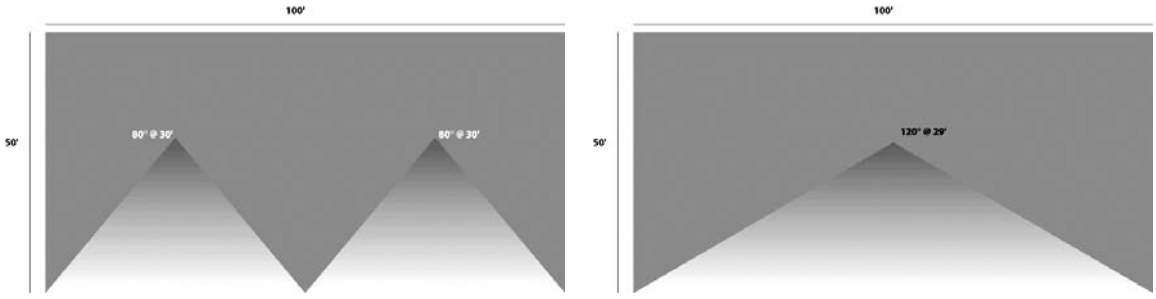
- Figure 2 : Plan view of coverage using two GEO curved vertical arrays. Both Configurable Directivity flanges have been installed in the bottom two cabinets of the clusters.

However, if we install Configurable Directivity Devices in the bottom two cabinets of the cluster, coverage will look more like the pattern in Figure 2.

In curved vertical arrays, the Configurable Directivity Device can be used:

- On the bottom two rows of curved vertical arrays, to fill in coverage gaps in the front rows.
- On all rows of curved vertical arrays, in cases where 240° of horizontal coverage is preferred to 160°.

In horizontal arrays of GEO S830s, the Configurable Directivity Device can be removed to narrow the vertical coverage of the array from 120° to 80°.



– Sectional view of a 100’ deep space, showing coverage alternatives using GEO S830 arrays aimed straight down, with (right) and without (left) CDD flanges.

GEO APPLICATION GUIDELINES

GEO is a highly adaptable and flexible system due to the unique performance factors of the patent-pending Hyperboloid Reflective Wavesource, the Configurable Directivity Device flanges and other innovations. However, like all tools, your GEO system has been designed to function in specific ways: these lend themselves to many situations, but not all. When designing and deploying GEO arrays, keep the following considerations in mind.

Minimum Array Height (Vertical Tangent Arrays)

Like any "line array," GEO's ability to control lower frequencies with longer wavelengths is determined by the height of the array. NEXO recommend that curved vertical GEO tangent arrays include at least four (4) S805's and one (1) S830. Lines shorter than this will not provide adequate control of lower frequencies. You will see this in GEOSoft2: the black dBA trace will curve downward and will approach the red HF trace towards the rear of the listening area. This indicates that lower frequencies are falling in level relative to the higher frequencies.

Optimum Height of the Bumper

Can be found by experimenting with different heights and aiming angles in GEOSoft2. Your system can also be ground staked by using the proper accessory and the later revision of the GEOSoft2 which allow the simulation of ground-stacked GEO vertical arrays.

How Loud for the Crowd?

Keep in mind that due to the superior coherency of GEO arrays, you may not need to get as loud in order to "hear what is going on" as was the case with previous generations of sound reinforcement loudspeakers using coercive megaphone-variant horn designs. The following chart offers some guidelines about the capability of curved vertical GEO tangent arrays of various lengths. Maximum values in dBA are for all cabinets angled at 0.31°, minimum values are for all cabinets angled at 5° ; these values are calculated for open air conditions. For an audience of the indicated total length, the ±3 dB value will probably fall somewhere in between the Min and Max values. So a four-tall vertical tangent array, you will be able to produce levels of between 105 dBA and 110 dBA from the front to the rear of a 10m long audience area, and from 87 to 92 dBA throughout an 80m long audience area.

GEO Array		Total Length of Audience Area			
Array Length	Output ±3 dB	10 meters	20 meters	40 meters	80 meters
4 x S805	dBA Min	105	99	93	87
	dBA Max	110	104	98	92
8 x S805	dBA Min	106	100	94	88
	dBA Max	111	108	104	98
12 x S805	dBA Min	107	101	95	89
	dBA Max	111	108	105	100
16 x S805	dBA Min	107	102	96	90
	dBA Max	113	110	107	104

GEO TANGENT ARRAY RIGGING SYSTEM

Before proceeding with assembly of GEOS / CD12 arrays, please ensure that the components are present and undamaged. A component list is appended to this manual. In the event of any shortage, please contact your supplier.

SAFETY FIRST

GeoS / CD12 Rigging System has been approved by Certification Organization RWTÜV. Structural computations, test reports, certificates are available in Geosoft2 or at Nexo (info@nexo.fr) upon request.

We include this section to remind you of safe practice when flying the GEOS / CD12 system. Please read it carefully. However, user must always apply his or her knowledge, experience and common sense. If in any doubt, seek advice from your supplier or NEXO agent.

This manual offers guidance only for GeoS / CD12 loudspeaker systems. References in this manual to other rigging equipment such as motor hoists, steels, shackles etc. are made to clarify the description of GeoS / CD12 procedures. The user must ensure that operators are properly trained by other agencies in the use of these items.

The GEOS / CD12 Rigging System has been optimised for the deployment of curved vertical tangent arrays of GEO S805 / S830 / CD12 loudspeakers. Vertical angle adjustment between cabinets has been limited to specific settings to ensure correct acoustic coupling.

The GEOS / CD12 Rigging System is a professional precision tool set, and should be handled with extreme care. Only persons who are fully conversant with the operation of the GEOS / CD12 Rigging System and provided with suitable safety equipment should deploy GEO Arrays. Misuse of the GEOS / CD12 Rigging System could lead to dangerous consequences. Please refer to the safety section of this manual for advice concerning GEOS / CD12 Rigging System installation and handling.

Used and maintained correctly, the GEOS / CD12 Rigging System will give many years of reliable service in portable systems. Please take the time to read and understand this manual. Always use GEOSoft2 to determine the optimum angle settings for a particular venue, hang point and curved vertical GEOS / CD12 array. Applied forces and moments are strongly cabinet quantity and angle configuration dependent. Cluster configuration must be implemented and validated in Geosoft2 prior to installation.

Flown Systems Safety

- Always inspect GEOS / CD12 Rigging System components for damage before assembly. Pay special attention to lifting points and safety clips. If you suspect that any of the components are defective DO NOT USE THE AFFECTED PARTS. Contact your supplier for replacements.
- Read this manual carefully. Also be familiar with the manuals and safe working procedures for any ancillary equipment that will be used with the GEOS / CD12 Rigging System.
- Ensure that all local and National regulations regarding the safety and operation of flying equipment are understood and adhered to. Information on these regulations may usually be obtained from Local Government Offices.
- When deploying the GEOS / CD12 Rigging System always wear protective headgear, footwear as well as eye protection.
- Do not allow inexperienced persons to handle the GEOS / CD12 Rigging System. Installation personnel should be trained in loudspeaker flying techniques and should be fully conversant with this manual.
- Ensure that motor hoists, hoist control systems and ancillary rigging components are currently certified as safe and that they pass a visual inspection prior to use.
- Ensure that public and personnel are not allowed to pass beneath the system during the installation process. The work area should be isolated from public access.

- Never leave the system unattended during the installation process.
- Do not place any object, no matter how small or light, on top of the system during the installation procedure. The object may fall when the system is flown and is likely to cause injury.
- Motor or hoist secondary safety steels must be installed once the system has been flown to the operating height. Secondary steels requirements depend on the local safety standards applicable to the territory.
- Ensure that the system is secure and prevented from pivoting around the motor hoist.
- Avoid any form of excessive dynamic loading to the assembly (structural computations on GeoS Rigging System are based on a 1/1.2 factor for hoist or motor acceleration).
- NEVER attach any item to the GEOS / CD12 system other than NEXO GEOS / CD12 accessories.
- When flying outdoor systems ensure that the system is not exposed to excessive wind or snow loads and is protected from rainfall.
- The GEOS / CD12 Rigging System requires minimum yearly inspection by a competent person. Please follow local regulations for inspection procedures.
- When de-rigging the system ensure that the same care is given to the load out procedure as for installation. Pack GEOS / CD12 Rigging System components carefully to prevent damage in transit.

Ground Stacking Safety

Statistically, many more injuries occur due to unstable ground stacked PA systems than those associated with flown systems. There are several reasons for this fact, however the message is clear:

- Always survey the supporting structure upon which a ground stack is to be built. Always look beneath PA wings to inspect the deck support and if necessary ask for the stage scrims and dressings be removed to allow access.
- If the stage surface slopes, as it does in some theatres, ensure that the system is prevented from sliding forwards due to vibration. This may require the fitting of timber battens to the stage floor.
- For outdoor systems ensure that that the system is protected from wind forces which might cause the ground stack to become unstable. Wind forces can be huge, especially upon large systems, and should never be underestimated. Observe meteorological forecasts, calculate the “worst case” effect upon the system prior to erection and ensure that the system is secured appropriately.
- Take care when stacking cabinets. Always employ safe lifting procedures and never attempt to build stacks without sufficient personnel and equipment.
- Never allow anyone, whether operators, artists or members of the public to climb onto a ground stacked PA system. Anyone who needs to climb over 2m high should be fitted with suitable safely equipment including a clip-on harness. Please refer to local Health and Safety legislation in your territory. Your dealer can help with advice on access to this information.
- Apply the same attention to all safety matters when de-stacking systems.
- Be aware that safety procedures are as important in the truck and in the warehouse as they are at the venue.

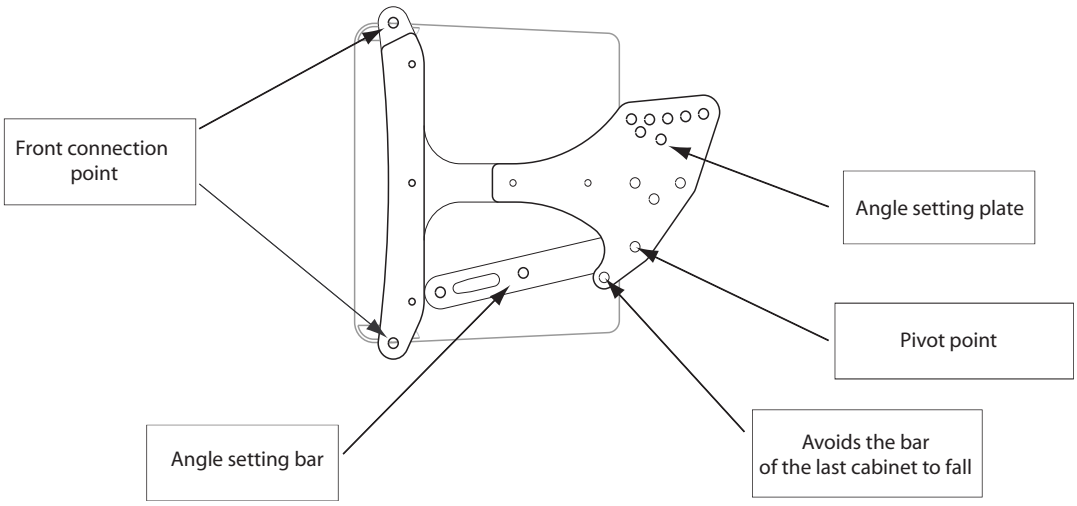
Contacts

Correct training is fundamental to safe practise when working with loudspeakers flying systems. NEXO recommend that users contact local industry associations for information on specialist course.

Information for International training agencies can be obtained by contacting either:

The Production Services Association (PSA), School Passage, Kingston-upon-Thames, KT1 SDU Surrey, ENGLAND Telephone: +44 (0) 181 392 0180	Rigstar Training and Testing Center 82 Industrial Dr. Unit 4 Northampton, Massachusetts 01060 U.S.A. Phone: 413-585-9869 -- Fax: 413-585-9872 school@rigstar.com
	ESTA Entertainment Services & Technology Association 875 Sixth Avenue, Suite 1005 NEW YORK, NY 10001 USA Phone: 212-244-1505 – Fax: 212-244-1502 info@esta.org - www.esta.org

GEO Loudspeakers

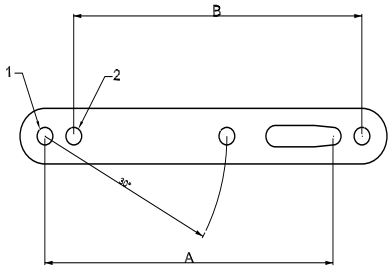


GEO S850 and S830 Tangent Array Modules are shipped from the factory with identical array assembly hardware. The GEO Tangent Array Assembly System has three attachment points on each side. The points in the front connect each GEO cabinet to the adjacent enclosures above and below. The angle between cabinets is set by attaching one end of the angle-setting bar to the proper hole on the angle-setting plate, which extends beyond the rear of the cabinet.

The front connection points and the angle-setting holes in the angle plate are milled for the supplied pins, which have a diameter of 8 mm. Possible replacements for specific applications include:

- Nuts and bolts with a diameter of 8mm or 5/16 in. (7.94 mm) for fixed installation
- 8mm (NEXO REF: **BLGEOS**) or 5/16 in pins with spring-loaded locking balls for quicker array assembly and disassembly in portable applications.

Angle-setting bar



Angles between cabinets are set using the force of gravity

The angle setting pivots on the hole marked 1. For all angles up to and including 17.5°, use the oblong hole on the unattached end of the bar (A). This allows you to set the angles of the array while the cabinets are lying flat on the ground. When the array is lifted into position each cabinet will fall automatically into the proper angle.

The 30° angle adjustment is always fixed, use hole marked 2, and is set using the hole on the very end of the angle-setting bar (B). This allows you to set the proper angles for GEO S830 cabinets regardless of whether the array is deployed vertically or horizontally.

Fixed Angle-Setting Points

For applications where setting the angles via gravity is either impossible (i.e. ground stacking) or undesirable (fixed installations), remove the front pin from the angle-setting bar and re-attach it at point 2. This pivot point is the same distance from the hole at the other end of the angle-setting bar as point 1 is from the end of the oblong slot. This makes it possible to set all angles up to 17.5° directly by attaching the angle-setting bar to the appropriate hole in the plate. For fixed angles, insert the pin through the hole at the tip of the angle-setting bar.

Assembling a curved vertical GEO array

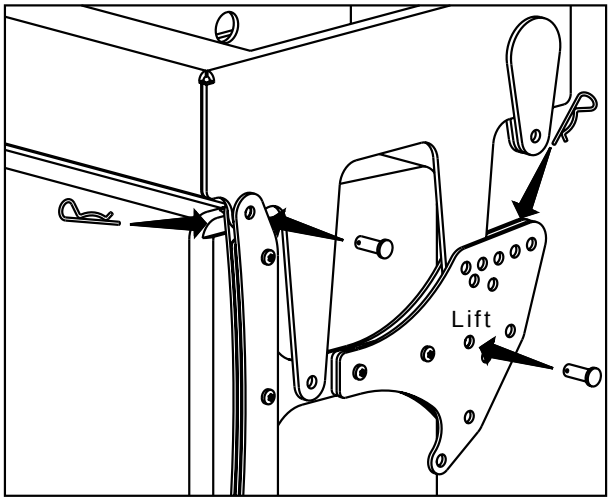
Attach the top cabinet to the bumper

The GEO Bumper is symmetrical, enabling you to use GEO loudspeakers in a left/right stereo configuration. The connection between the top GEO enclosure and the bumper determines the left/right orientation for the entire array. Figure 3 shows the woofer on the left, and Figure 4 shows the woofer on the right. If you attach the top GEO enclosure in this way, you must remove and replace the angle-setting plates in order to properly attach the top GEO enclosure at the rear of the bumper.

- Figure 3

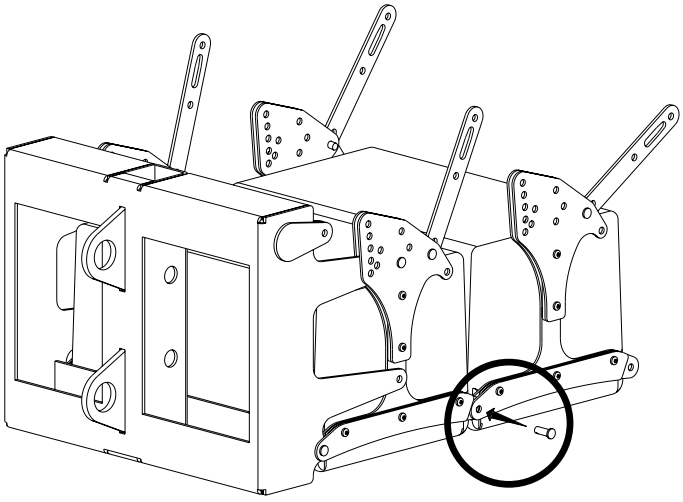
- Figure 4

After having positioned the top enclosure, insert the pins into the front and rear attachment points and lock them with R clips (see picture). The bumper's rear mounting point should be connect to the hole marked "LIFT" on the GEO Angle Adjustment Plate. NOTE: The top GEO enclosure is always parallel to the bumper.



Assembling a vertical GEO tangent array

Place the top GEO cabinet (attached to the bumper) face down on a horizontal surface (a narrow length of carpet will help protect the grills). Align the top holes of the next GEO cabinet's front attachment bar with the bottom holes of the first GEO cabinet's front attachment bar and insert the pins to connect both sides at the front (see below). Repeat this operation until the entire array is connected at the fronts of the enclosures.



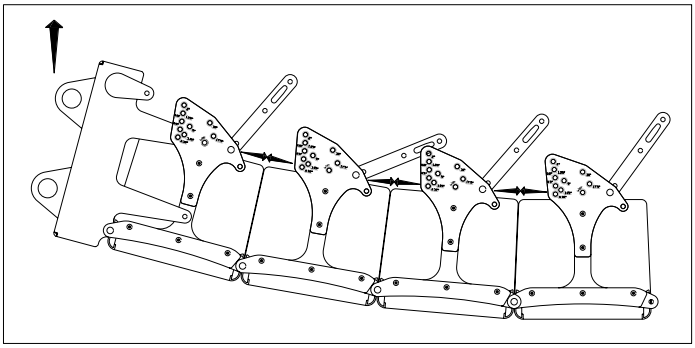
Setting the angles between adjacent GEO enclosures

To set the angles between enclosures to the values specified for this array by GEOSoft2, begin by lifting the array until only the bottom enclosure remains on the ground. This will make it easier to align the angle-setting bars with the proper holes in the angle-setting plates (see Figure 5).

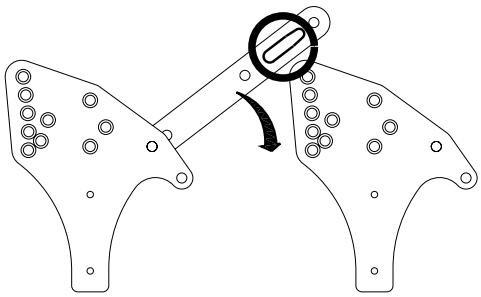
Align the angle-setting bars with the proper holes in the angle-setting plates. For all GEO enclosures except the S830, insert pins through the hole in the angle-setting plate and the oblong slot at the end of the angle-setting bar (see Figure 6).

NOTE: GEO S830's are always "tight-packed" with the adjacent enclosure so that the wavefronts will be tangent and will combine coherently without interference. The angle of a GEO S830 at the bottom of a curved vertical array and just below a GEO S850 will therefore be 17.5°. The angle between any two GEO S830's will always be 30°.

Continue lifting the array so that the fronts of all the enclosures are accessible, then lock all the attachment pins in place with R-clips. While the array is being raised to the operating height specified by GEOSoft2, the enclosures will fall into the proper angular alignment with each other.



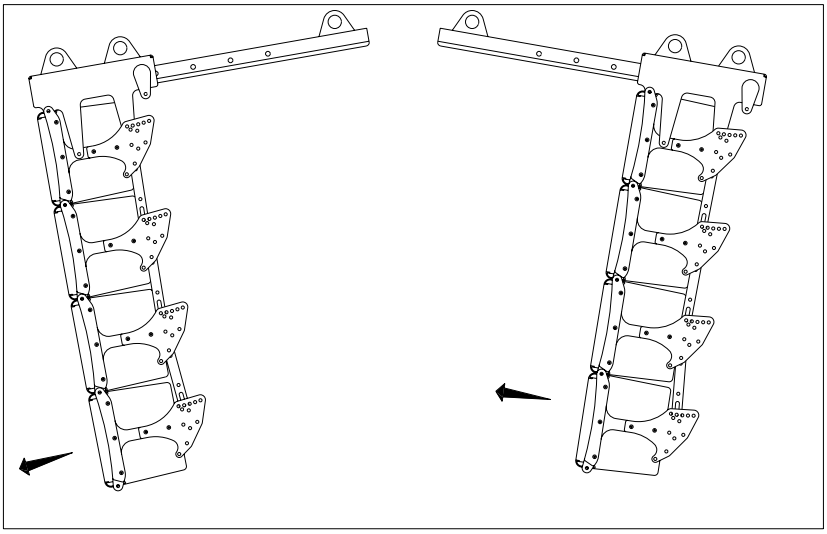
- Figure 5



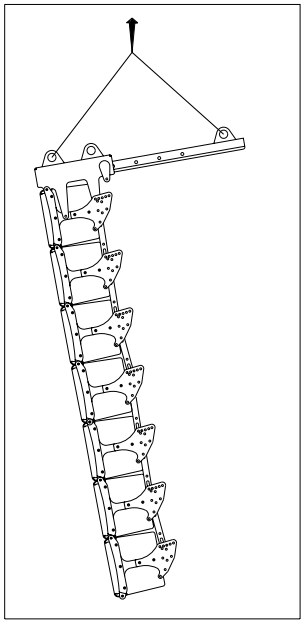
- Figure 6

CAUTION: The GEO Bumper is designed to safely fly a maximum of 24 GEO loudspeakers. Before raising the array to its operating height, be sure to check that all attachment pins are in place, secured by R-clips or another locking mechanism and that both sides angles settings are strictly identical.

Extension Bar



- Figure 7



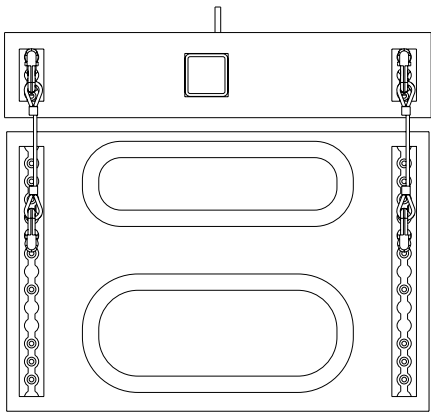
- Figure 8

The GEO Bumper has two lift points, which are adequate for many situations. The extension bar is designed for those applications where the bumper's lift points are too close together to allow setting the proper tilt angle for the entire array. With 16 GEO cabinets, a vertical GEO array can be tilted ±15°. NOTE: Always use an inclinometer and/or a laser aiming device to verify that the array has the tilt angle specified in GEOSoft2.

The extension bar has several tilt-angle adjustment points. It must always be secured by inserting two of the supplied 12mm pins into two of these points: pins must be locked in place with the supplied R-clips. The GEO bumper, with or without the extension bar, should be lifted by a single motor hoist using the two adjustable chains connected to a central flying ring (see Figure 8).

CD12 BUMPER

The bumper of the CD12 is an independent hardware element that enables GEO users to fly one or more CD12's either alone or directly behind a GEO array. The CD12 bumper is shipped with four link steels. To connect the top CD12, attach these steels to the four rails located on the bumper and the four rails located on the CD12 (Figure 9).



- Figure 9

Combination GEO/CD12 bumper

It is possible to make a single bumper by using the connecting bar to join the GEO bumper and the CD12 bumper. The cluster will then consist of:

- The GEO enclosures, attached to the GEO bumper
- The CD12 enclosures, attached to the CD12 bumper directly behind the GEO array
- The connecting bar which joins the entire array assembly together.

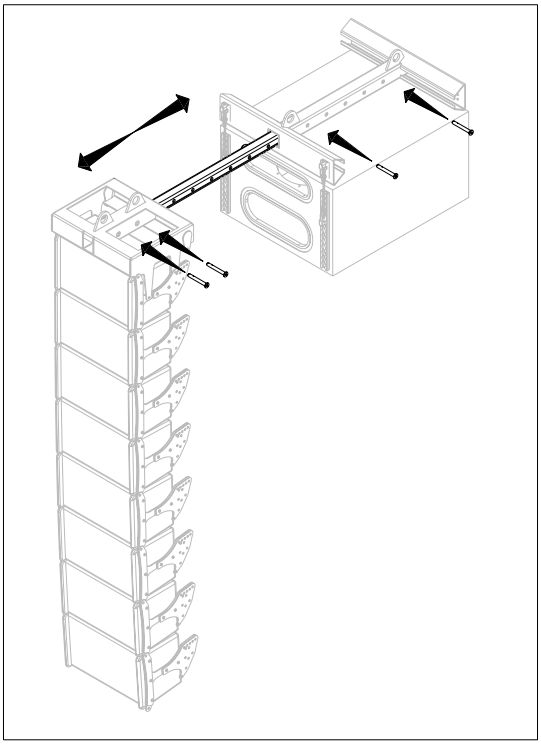
The procedures for attaching GEO loudspeakers and CD12 enclosures to their respective bumpers are the same as previously explained.

The connecting bar must be passed through the bodies of both bumpers and locked in position using two 12mm pins for each bumper. These 12mm pins use the same R-clips as on the GEO pins (see Figure 10).

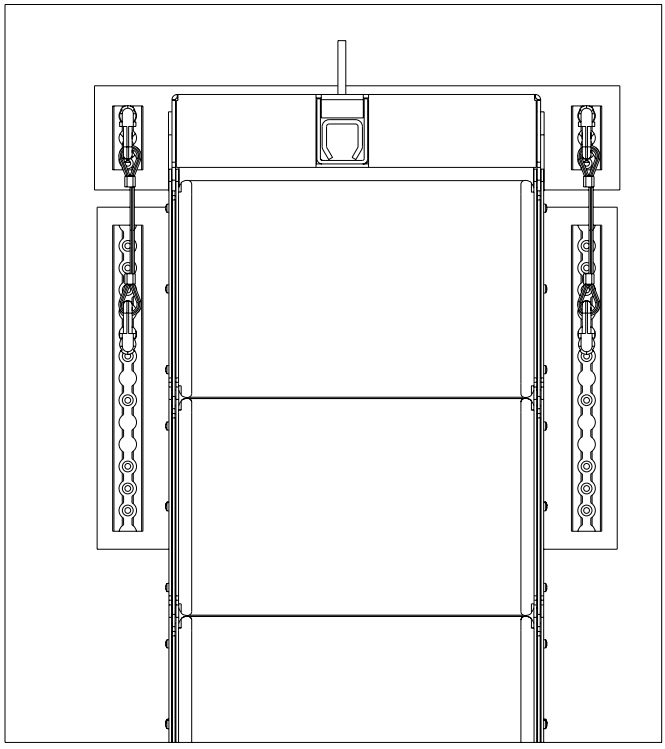
NOTE: The list points of the CD12 Bumper are positioned on the centre of gravity of the CD12. They are offset from the centre of the tube to allow the correct positioning when assembling a combination GEO/CD12 bumper.

If you are assembling left/right stereo arrays as described in section IV-1, you must reverse the CD12 bumper in order to maintain the correct orientation with respect to the GEO Array. In a frontal view of the cluster, the GEO array must be centred with respect to the CD12. (see Figure 11).

CAUTION: In this configuration, the CD12 Bumper is designed to hang a maximum of 8 CD12 enclosures.



- Figure 10



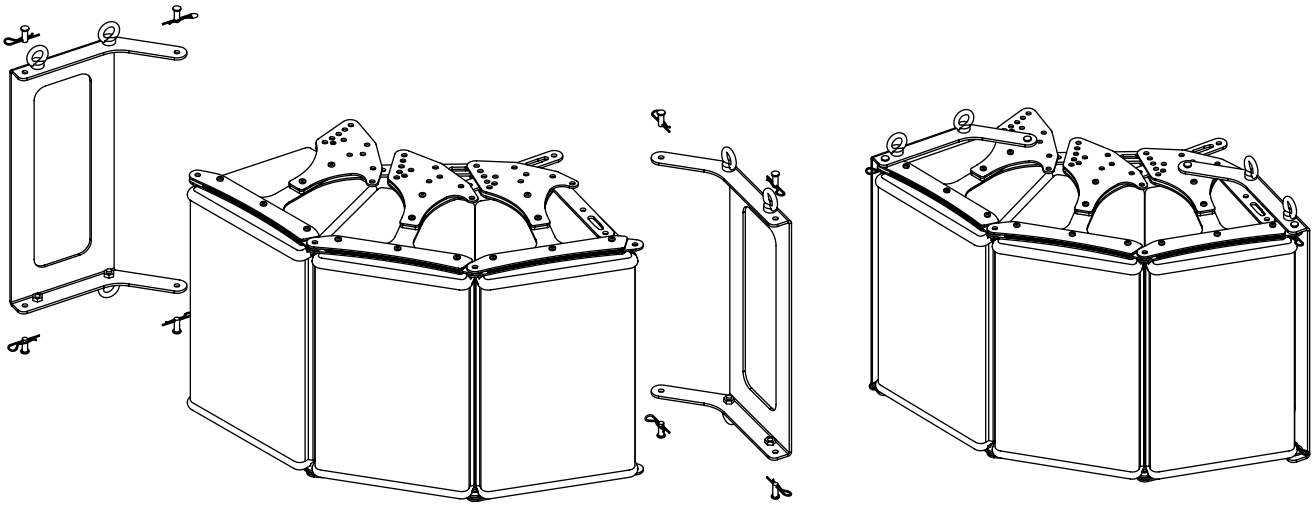
- Figure 11

Assembling Horizontal GEO Arrays

Horizontal GEO arrays are composed exclusively of GEO S830 loudspeakers.

In this configuration, it is imperative that the cabinets are “tight packed,” that is arrayed at 30° splay angles, matching the trapezoidal sides of the GEO S830 enclosures. This ensures that the wavefronts are truly tangent and combine without destructive interference.

Up to three Horizontal GEO S830 arrays can be well hung by using the accessory **GEOS-HRPL**, attached to the GEO Array Assembly System with 8mm rings and locking nuts. Always use the “LIFT” point for the rear attachment. To vary the vertical angle of the array, use different points for the front attachment. For mounting instruction, please refer to the document shipped with the accessory.

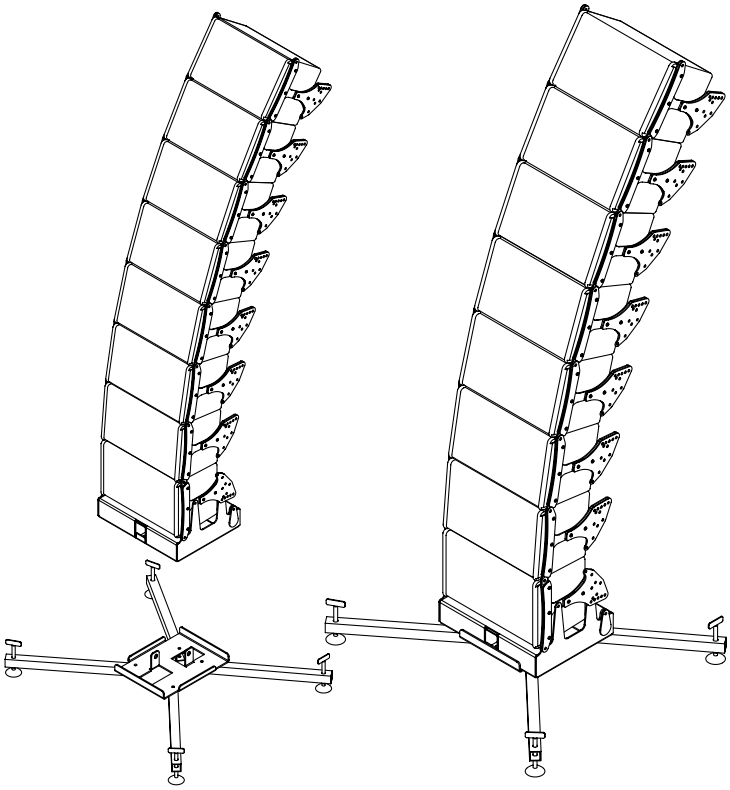


Ground stacking Geo Array

Up to 8 GEO S805 cabinets can be stacked with the accessory **GEOS-GRND**. GEO S830 should never be ground stacked together with GEO S805. The stacking configuration is taken into account in the GEOSoft2 software. For mounting instruction, please refer to the document shipped with the accessory.

Before assembling for stacked configuration, remove the front pin from the angle-setting bar and re-attach it at point 2. This pivot point is the same distance from the hole at the other end of the angle-setting bar as point 1 is from the end of the oblong slot. This makes it possible to set all angles up to 5° directly by attaching the angle-setting bar to the appropriate hole in the plate. For fixed angles, insert the pin through the hole at the tip of the angle-setting bar.

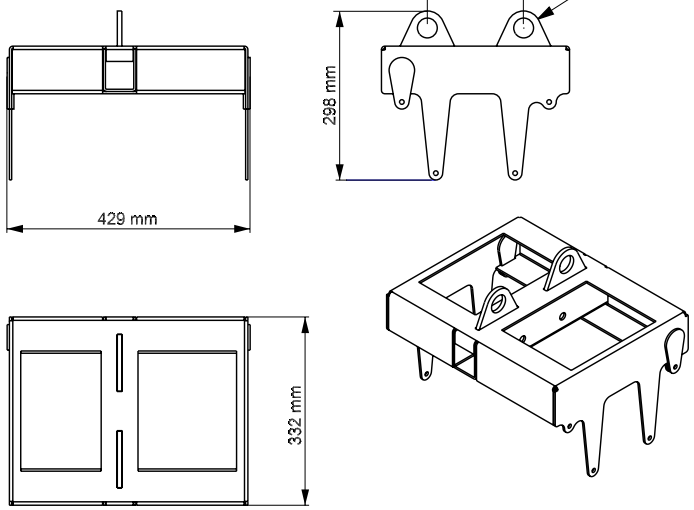
Properly adjust **GEOS-GRND** front and rear legs so that GEOS stack assembly footprint remains inside GEOS-GRND footprint.

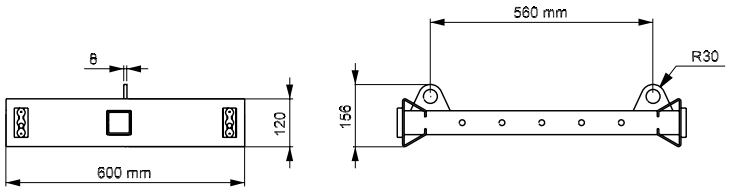


Dimensions & Weights

GEOS-BUMPER

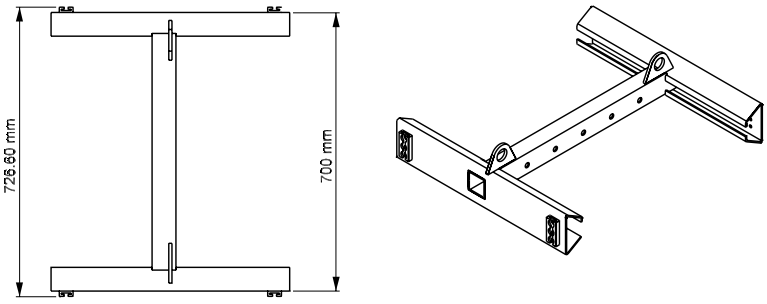
Weight 11kg / 24.25 lbs





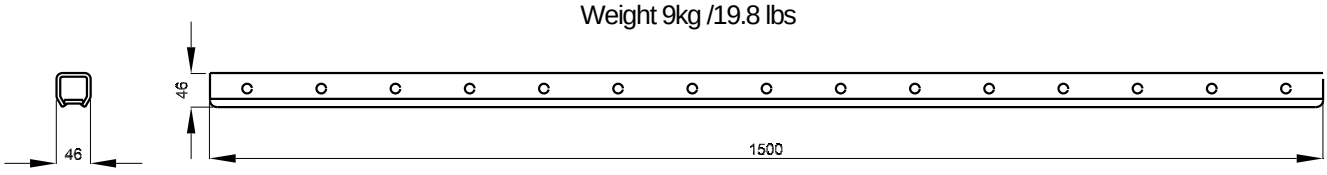
CD12-BUMPER

Weight 15kg / 33 lbs



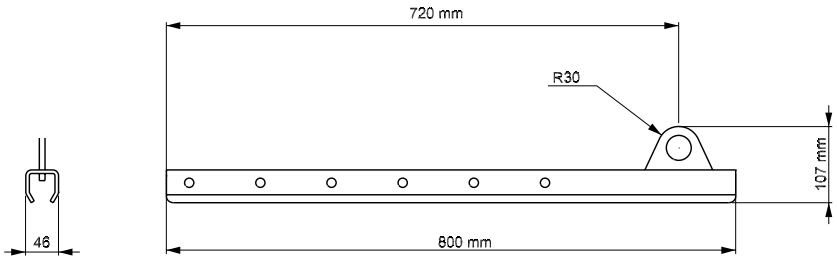
Link BAR (CD12-LINKBAR)

Weight 9kg /19.8 lbs



GEO/CD12 Extension BAR (EXBAR-S)

Weight 4kg / 8.8 lbs

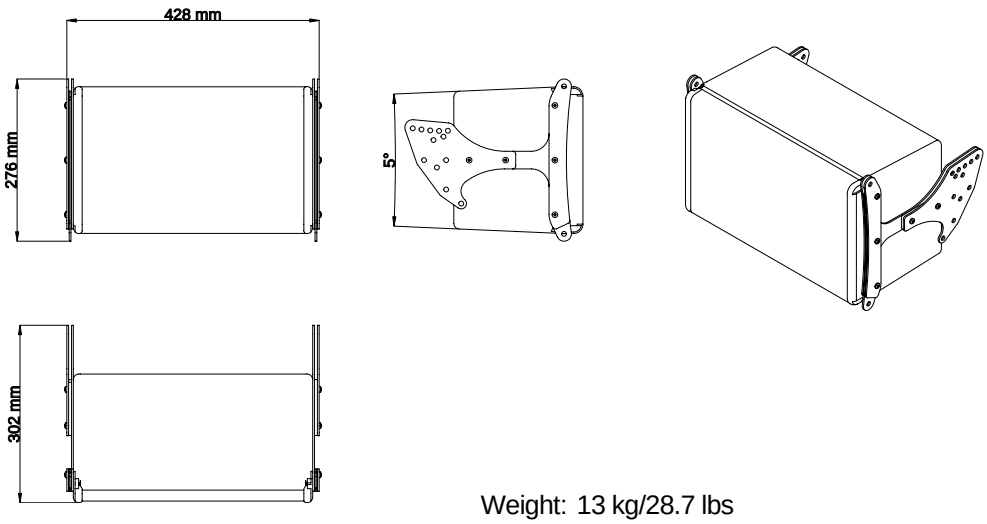


TECHNICAL SPECIFICATIONS

GEO S805

SYSTEM SPECIFICATIONS	GEO S805 with NX242 TDcontroller
Frequency Response [a]	67 Hz – 19 kHz ± 3 dB
Usable Range @-6dB [a]	60 Hz – 20 kHz
Sensitivity 1W @ 1m [b]	99 dB SPL Nominal -97 dB SPL Wideband
Peak SPL @ 1m [b]	125 to 128 dB Peak for a single cabinet. Configuration dependant when arrayed.
Dispersion [c]	Coupling Plane: Not useable as a single cabinet. Configuration dependant Non-coupling plane: 120° (configurable to 80°).
Directivity Index [c]	Not useable as a single cabinet. Configuration dependant
Crossover Frequency	1.8 kHz Passive
Nominal Impedance	16 ohms
Recommended Amplifiers	1500 to 3000 Watts into 4 ohms / 4 cabinets per channel. Up to 6 cabinets per channel may be connected to large amplifiers capable of operating into low impedance loads.
FEATURES	**GEO S805**
Components	LF: 1 x 8" (20cm) Neodymium Hi-flux 16 Ohm Driver HF: 1 x 1" Throat Neodymium Driver on a Hyperboloid Reflective Wavesource
Height x Width x Depth	406 x 250 x 219 mm (16" x 9 7/8" x 5 5/8") without flying hardware
Shape	5° Trapezoid
Weight	13 kg (28.7 lbs) with Tangent Array Assembly System; 10.5 kg (23 lbs) net
Connectors	2 x NL4MP SPEAKON 4 pole (In & Through)
Construction	Baltic Birch Ply finish with structured black coating.
Front Finish	Perforated Steel Grill
Flying points	Integral flying system. Intercabinet Angle Adjustments = 0.31 to 5° (logarithmic steps), 17.5° & 30°
SYSTEM OPERATION	
Electronic Controller	The NX242 Digital TDcontroller presets are precisely matched to the GEO S8-Series cabinets and include sophisticated protection systems. Using GEO S Series cabinets without a properly connected NX242 Digital TDcontroller will result in poor sound quality and can damage components.
HF Dispersion Configuration	After quick release of the front grill from its fittings, the HF Waveguide can be configured for 80° or 120° dispersion in the non-coupling plane.
Array Design	Arrays of less than 4 GEO S805 will provide poor dispersion control and are not recommended or supported. S805 and S830 cabinets, having tangent waveguides, can be mixed in the same array.
Sub-bass	The GEO S805 can be used without the optional CD12 Hypercardiod Sub. In this case the NX242 can be used in stereo. With the CD12 Hypercardiod Sub each Sub channel requires two NX242 outputs and the NX242 will operate in mono.
Speaker Cables	The GEO S805 are wired 1- & 1+ on both Speakon connectors; 2- & 2+ are not connected.
Rigging System	See corresponding chapter of this manual.

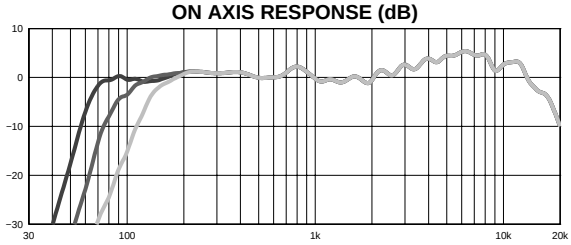
[a] [b] [c] See measurement notes at the end of CD12 specifications



Weight: 13 kg/28.7 lbs

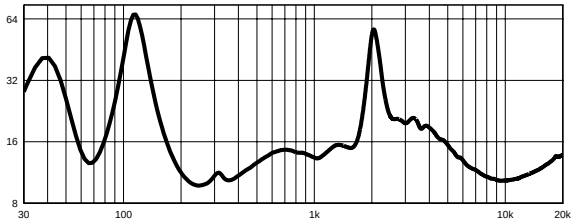
GEO S805 curves

ON AXIS RESPONSE (dB)



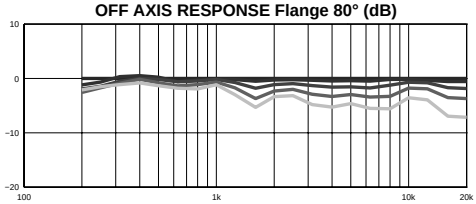
On Axis response in dB. From dark to light: set up 'wide range', 'CD12 stacked' and 'CD12 flown'.

IMPEDANCE (Ohms)



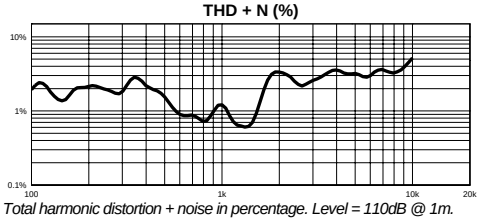
Impedance in Ohms

OFF AXIS RESPONSE Flange 80° (dB)



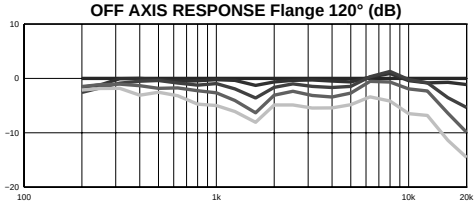
Off axis response in dB in the non-coupling plane flange 80°.
Dark to light: 0°, 10°, 20°, 30° and 40° off axis.

THD + N (%)



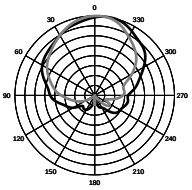
Total harmonic distortion + noise in percentage. Level = 110dB @ 1m.

OFF AXIS RESPONSE Flange 120° (dB)

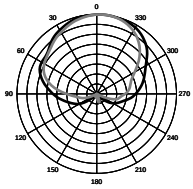


Off axis response in dB in the non-coupling plane flange 120°.
From dark to light: 0°, 15°, 30°, 45° and 60° off axis.

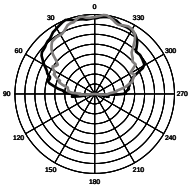
2500Hz



5000 Hz

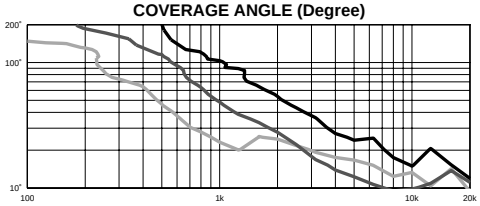


10000 Hz



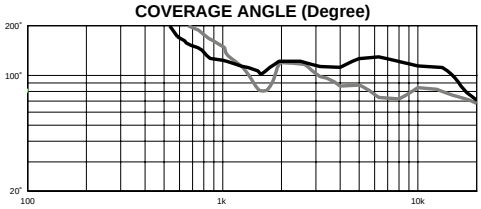
Flange 80° (dark) and flange 120° (light) polar plot in the non-coupling plane.
3dB/division.

COVERAGE ANGLE (Degree)



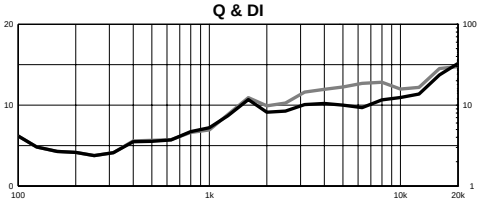
Total coverage @-6dB in the coupling plane in degrees.
From dark to light: 1, 2 and 4 boxes.

COVERAGE ANGLE (Degree)



Total coverage @-6dB in the non-coupling plane in degrees:
flange 80° (dark) and flange 120 (light).

Q & DI



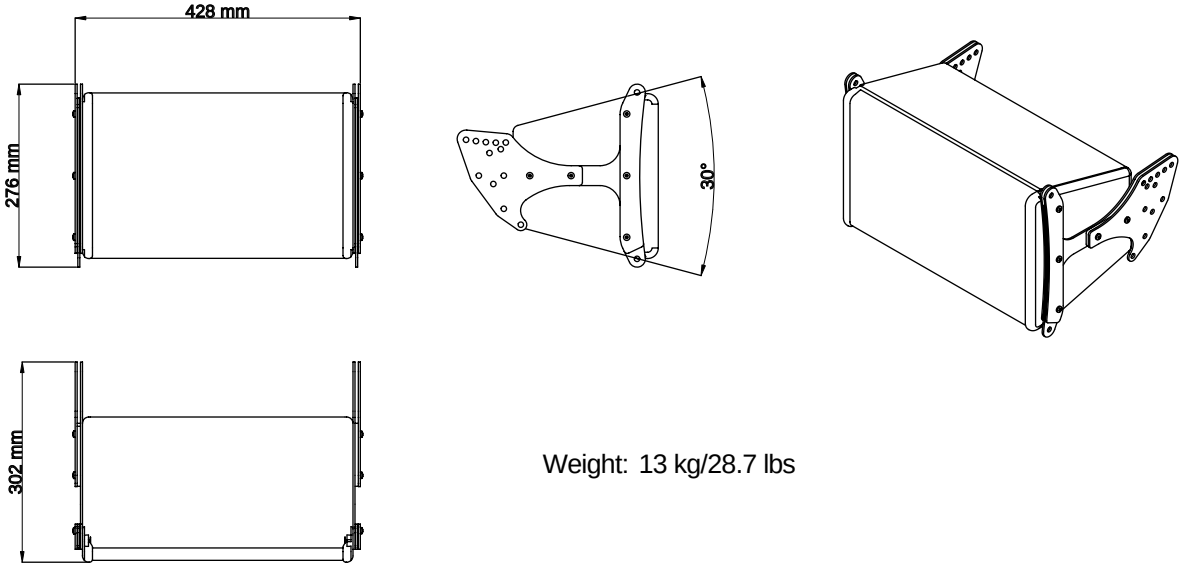
Directivity Index in dB (Left hand side scale) and directivity factor (Right hand side scale) for flange 120° (dark) and flange 80° (light).

All measurements made with dedicated NX program.
Measurements conditions: far field, half space below 400Hz; anechoic above 400Hz.
Directivity Index and factor: computer synthesized from coverage. Coverage 1/3rd octave band synthesized from FFT measurements.

GEO S830

SYSTEM SPECIFICATIONS	GEO S830 with NX242 TDcontroller
Frequency Response [a]	67 Hz – 19 kHz ± 3 dB
Usable Range @-6dB [a]	60 Hz – 20 kHz
Sensitivity 1W @ 1m [b]	99 dB SPL Nominal -97 dB SPL Wideband
Peak SPL @ 1m [b]	125 to 128 dB Peak for a single cabinet. Configuration dependant when arrayed
Dispersion [c]	Coupling Plane: 30° for a single cabinet. Configuration dependant Non-coupling plane: 120° (configurable to 80°).
Directivity Index [c]	DI = 12 Nominal (f > 1.5 kHz) for a single cabinet. Configuration dependant when arrayed.
Crossover Frequency	1.8 kHz Passive
Nominal Impedance	16 ohms
Recommended Amplifiers	1500 to 3000 Watts into 4 ohms / 4 cabinets per channel. Up to 6 cabinets per channel may be connected to large amplifiers capable of operating into low impedance loads.
FEATURES	**GEO S830**
Components	LF: 1 x 8" (20cm) Neodymium Hi-flux 16 Ohm Driver HF: 1 x 1" Throat Neodymium Driver on a Hyperboloid Reflective Wavesource
Height x Width x Depth	406 x 250 x 219 mm (16" x 9 7/8" x 5 5/8") without flying hardware
Shape	30° Trapezoid
Weight	13 kg (28.7 lbs) with Tangent Array Assembly System; 10.5 kg (23 lbs) net
Connectors	2 x NL4MP SPEAKON 4 pole (In & Through)
Construction	Baltic Birch Ply finish with structured black coating.
Front Finish	Perforated Steel Grill
Flying points	Integral flying system. Intercabinet Angle Adjustments = 0.31 to 5° (logarithmic steps), 17.5° & 30°
SYSTEM OPERATION	
Electronic Controller	The NX242 Digital TDcontroller presets are precisely matched to the GEO S8-Series cabinets and include sophisticated protection systems. Using GEO S Series cabinets without a properly connected NX242 Digital TDcontroller will result in poor sound quality and can damage components.
HF Dispersion Configuration	After quick release of the front grill from its fittings, the HF Waveguide can be configured for 80° or 120° dispersion in the non-coupling plane.
Array Design	S805 and S830 cabinets, having tangent waveguides, can be mixed in the same array.
Sub-bass	The S830 can be used without the optional CD12 Hypercardiod Sub. In this case the NX242 can be used in stereo. With the CD12 Hypercardiod Sub each Sub channel requires two NX242 outputs and the NX242 will operate in mono.
Speaker Cables	The GEO S830 are wired 1- & 1+ on both Speakon connectors, 2- & 2+ are not connected.
Rigging System	See corresponding chapter of this manual.

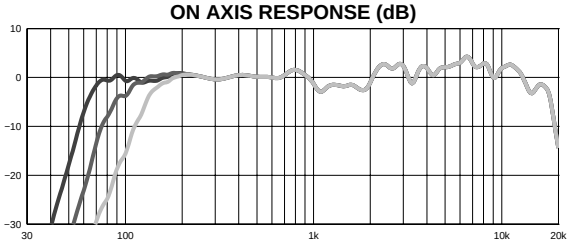
[a] [b] [c] See measurement notes at the end of CD12 specifications



Weight: 13 kg/28.7 lbs

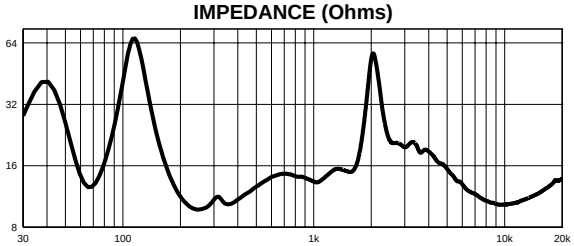
GEO S830 curves

ON AXIS RESPONSE (dB)



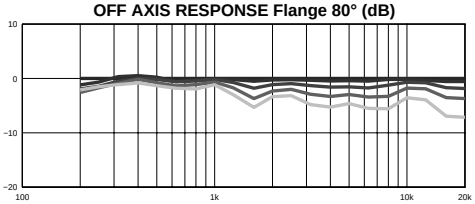
On Axis response in dB. From dark to light: set up 'wide range', 'CD12 stacked' and 'CD12 flown'.

IMPEDANCE (Ohms)



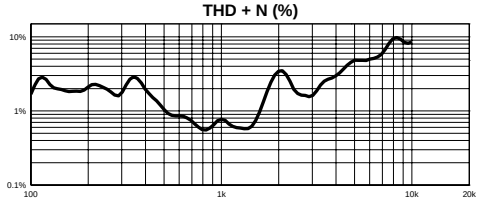
Impedance in Ohms.

OFF AXIS RESPONSE Flange 80° (dB)



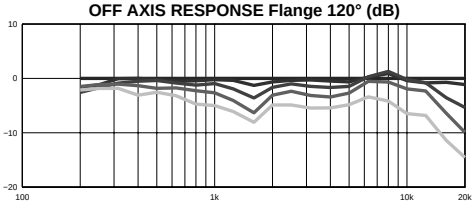
Off axis response in dB in the non-coupling plane flange 80°.
Dark to light: 0°, 10°, 20°, 30° and 40° off axis.

THD + N (%)



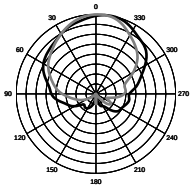
Total harmonic distortion + noise in percentage. Level = 110dB @ 1m.

OFF AXIS RESPONSE Flange 120° (dB)

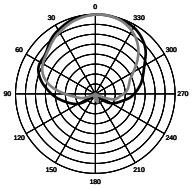


Off axis response in dB in the non-coupling plane flange 120°.
From dark to light: 0°, 15°, 30°, 45° and 60° off axis.

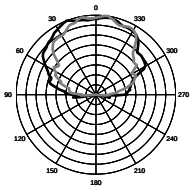
2500Hz



5000 Hz

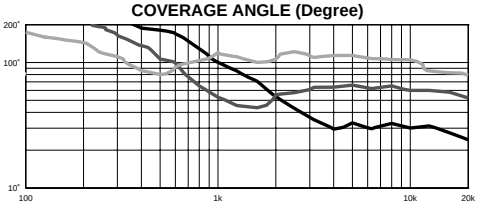


10000 Hz



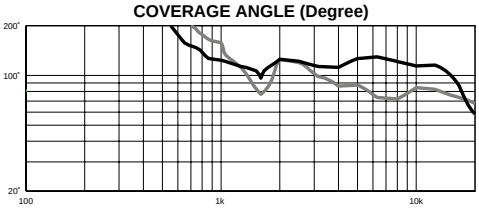
Flange 80° (dark) and flange 120° (light) polar plot in the non-coupling plane. 3dB/division.

COVERAGE ANGLE (Degree)



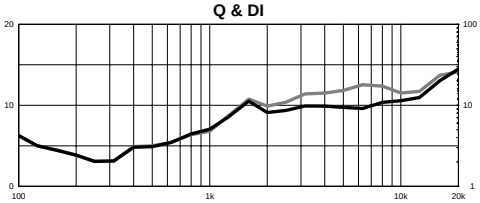
Total coverage @-6dB in the coupling plane in degrees.
From dark to light: 1, 2 and 4 boxes.

COVERAGE ANGLE (Degree)



Total coverage @-6dB in the non-coupling plane in degrees: flange 80° (dark) and flange 120 (light).

Q & DI



Directivity Index in dB (Left hand side scale) and directivity factor (Right hand side scale) for flange 120° (dark) and flange 80° (light).

All measurements made with dedicated NX program.
Measurements conditions: far field, half space below 400Hz; anechoic above 400Hz.
Directivity Index and factor: computer synthesized from coverage. Coverage 1/3rd octave band synthesized from FFT measurements.

GEO CD12

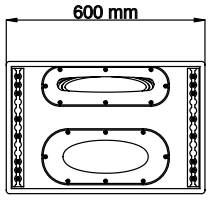
SYSTEM SPECIFICATIONS	CD12 with NX242 TDcontroller
Frequency Response [a]	42 Hz – 200 Hz ± 3 dB
Usable Range @-6dB [a]	39 Hz – 250 Hz
Sensitivity 1W @ 1m [b]	102 dB SPL Nominal
Peak SPL @ 1m [b]	131 to 134 dB Peak (500 to 1200W RMS Amp)
Dispersion [c]	Hypercardiod pattern 120° x 120° over the entire useable bandwidth. Directivity Control is achieved through DSP algorithms in the NX242 Digital TDcontroller (two channels of the NX242 are used for the process).
Directivity Index [c]	Q = 3.773 DI = 5.7 dB over the entire useable bandwidth.
Crossover Frequency	150 Hz Active through NX242 Digital TDcontroller
Nominal Impedance	2x 6 Ohms
Recommended Amplifiers	2 amplifier channels are required for Hypercardiod operation, each rated at 1500 to 3000 Watts into 4 ohms per channel. Up to 2 complete CD12s per channel may be connected to a two channel amplifier.
FEATURES	**GEO CD12**
Components	2 x 12" (30cm) Long Excursion Neodymium 6 Ohm Driver
Height x Width x Depth	400 x 600 x 754 mm (15 3/4" x 23 5/8" x 29 11/16")
Shape	Rectangular
Weight: Net	35 kg (77 lbs)
Connectors	2 x NL4MP SPEAKON 4 pole (In & Through)
Construction	Baltic Birch Ply finish with structured black coating. Dark grey carpet finish also available.
Flying points	Integral flying system.
SYSTEM OPERATION	
Electronic Controller	The NX242 Digital TDcontroller presets are precisely matched to the GEO S8-Series cabinets and include sophisticated protection systems. Using GEO S8-Series cabinets without a properly connected NX242 Digital TDcontroller will result in poor sound quality and can damage components.
Sub-bass	The GEO S805 & S830 can be used without the optional CD12 Hypercardiod Sub. In this case the NX242 can be used in stereo. With the CD12 Hypercardiod Sub each Sub channel requires two NX242 outputs and the NX242 will operate in mono.
Speaker Cables	The front loudspeaker of the CD12 is wired 2+ & 2- while the rear loudspeaker is wired 1- & 1+. The CD12 must use separate cables to the GEO S805/S830.
Rigging System	See corresponding chapter of this manual.

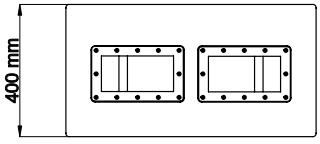
As part of a policy of continual improvement, NEXO reserves the right to change specifications without notice.

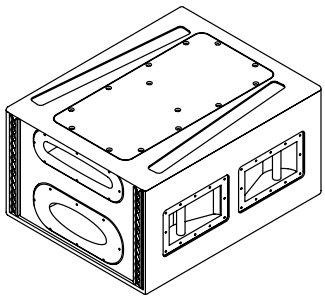
[a] Response Curves and Data: Anechoic Far Field above 200 Hz, Half-space Anechoic below 200 Hz.
Usable Range Data: Frequency Response Capability with TD crossover slopes removed.

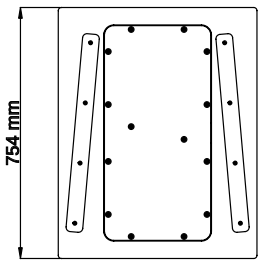
[b] Sensitivity & Peak SPL: will depend on spectral distribution. Measured with band limited Pink Noise.
Refers to the specified +/- 3 dB range. Data are for Speaker + Processor + recommended amplifier combinations.

[c] Directivity Curves and Data: 1/3 octave smoothed frequency response, normalized to On-Axis response. Data obtained by computer processing of off-axis response curves.





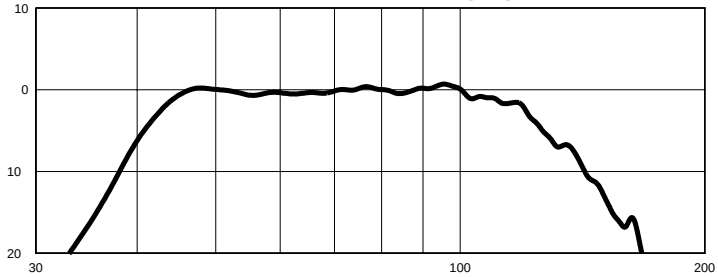




Weight : 35 kg/77 lbs

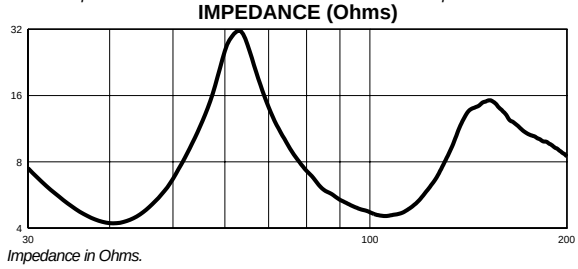
CD12 curves

ONAXIS RESPONSE (dB)



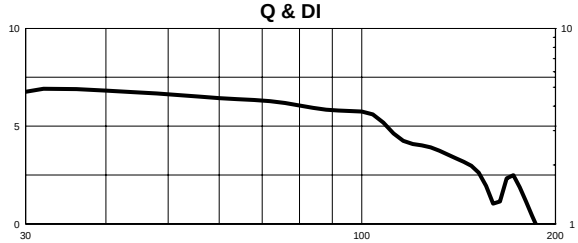
On-axis response in dB. Maximum Bandwidth. Actual bandwidth depends from NX242 settings

IMPEDANCE (Ohms)



Impedance in Ohms.

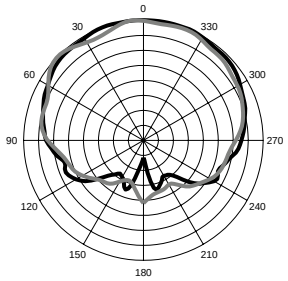
Q & DI



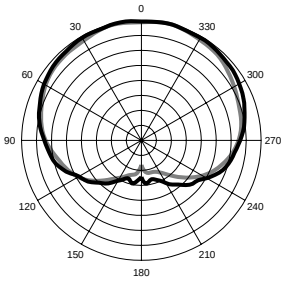
Directivity Index in dB (Left hand side scale) and directivity factor (Right hand side scale).

All measurements made with dedicated NX242 program.
Measurements conditions: far field, half space below 400Hz; anechoic above 400Hz. Directivity Index and factor: computer synthesized from coverage. Coverage 1/3rd octave band synthesized from FFT measurements.

40 Hz

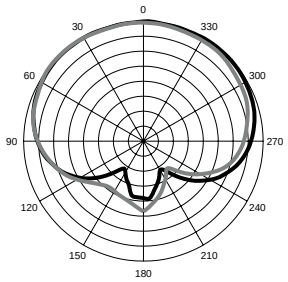


63 Hz

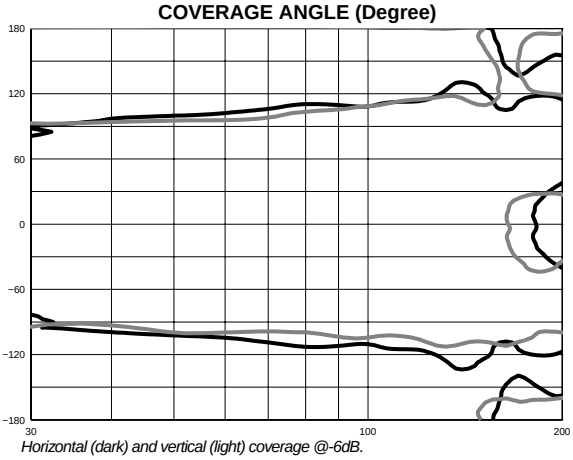


Horizontal (dark) and vertical (light) polar plot. 3dB/division.

100 Hz



COVERAGE ANGLE (Degree)



Horizontal (dark) and vertical (light) coverage @-6dB.

USER'S NOTES

France

Nexo S.A.

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Translation:

Mark Approval Certificate

No. 2644/05 Rev. 1

Only valid with Terms and Conditions overleaf

RWTÜV Systems GmbH, Postfach 10 32 61, D-45032 Essen

LICENCE HOLDER: NEXO S.A.
154 alée des Erables, 95950 Roissy CDG Cedex, France

MANUFACTURING LOCATION: see above

Reference of applicant	Date of application	File reference	Date of issue
Mr. Deffrages	27.09.2005	2.4-941/03 Brau/A05	Valid until 28.09.2010

TEST MARK:

for technical products, components and accessories of technical work equipment

KIND OF PRODUCT: array assembly system for a loudspeaker system type Geo S

max. load: 24 loudspeaker cabinets of the type Geo S 805
or Geo S 830 in combination with
max. 8 subbass cabinets of the type CD 12

permitted mounting angle:
Geo S805 and Geo S805 = 5°
Geo S805 and Geo S830 = 17,5°
Geo S830 and Geo S830 = 30°

max. wind speed: 27 m/s (8 Beaufort)

Test Report No.: 2643/05

TESTED ACCORDING TO: BGV C1: 1998
DIN 18800-1:1990

ADDITIONAL INFORMATION: -

The Certification Program for equipment safety of RWTÜV Systems GmbH, designated as a certification body for technical equipment and consumer product by the Federal Minister for Economy and Labour, together with its associated testing laboratories, hereby confirms:
the type tested product itemized above complies with the state of the art. So far as it is used as a component or accessory for technical equipment or consumer products it fulfils the specifications as laid down in the current version of the Act on Technical Equipment and Consumer Products valid as of 06.01.2004.
Permission to use the Test Mark in accordance with the conditions of contract printed overleaf is hereby granted.

Zertifizierungsstelle für Gerätesicherheit
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Test report
No. 2643/05

about the test of a technical equipment

Applicant: NEXO S.A.
154 alée des Erables
95950 Roissy CDG Cedex
France

Order No.: 20616458/10

This report contains 3 text pages.

Designed: 23.09.2005 by: U. Brau

Reviewed: 23.09.2005 by: i.V. K. Büc

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TÜV NORD

Applicant:	NEXO S.A. 154 alée des Erables 95950 Roissy CDG Cedex France		
Reference/Equipment:	array assembly system for a loudspeaker system type Geo S		
Rating:	max. load:	24 loudspeaker cabinets of the type Geo S850 or Geo S 830 in combination with max. 8 sub bass cabinets of the type CD 12	
	permitted mounting angle:	Geo S805 and Geo S805	= 5°
		Geo S805 and Geo S830	= 17,5°
		Geo S830 and Geo S830	= 30°
	max. wind speed:	27 m/s (8 Beaufort)	
Date of receipt:	14.01.2004		
Type of examination:	type approval		
Test regulations:	BGV C1: 1998 DIN 18800-1:1990		
Testing period:	04.2005 - 09.2005		
Test location:	Technology centre of RWTÜV Systems GmbH Manufacturer (Roissy)		
Annex (No. of pages):	-		

1. Documentation:

The following documentation has been used for the test:

- Structural analysis for the Geo S assembly system pages 1-48 dated January 2004
- Annex I Geo S mechanical Test 12.01.2004 pages 1-27 dated January 2004
- Annex II Static Report for the angle adjuster for Geo S – System pages A1-A7 dated January 2004
- Manual for the Geo S System pages 1-47
- Manual for the Software GEOSOFT 2.0

2. Remarks:

Only the mechanical components have been the subject of the type approval.

3. Test result:

All parts of the above described array assembly system for a loudspeaker system are sufficient dimensioned.
Assemblies of the above described array assembly system need to be tested at the final location of use before initial operation.